CHAPTER 2

ALTERNATIVES

CHAPTER SUMMARY: As stated in Chapter 1, the Kodiak Airport Runway Safety Areas (RSAs) on the ends of two runways need to be improved because they do not meet FAA standards. The purpose of this project is to improve the RSAs to meet those standards to the extent practicable. This chapter examines a range of alternatives for achieving that purpose.

This Alternatives Chapter examines the No Action Alternative required by NEPA, as well as a range of alternatives to meet the purpose and need of the project. The back of this EIS contains a fold-out illustration graphically depicting each alternative for use by the reader when reviewing the document.

A fold-out graphic of all the alternatives is located at the back of this document to assist the reader.

Federal environmental regulations concerning the environmental review process require that all reasonable alternatives that may accomplish the objectives of a proposed project be identified and evaluated. Such a requirement serves to establish that all reasonable alternatives have been considered and that an alternative capable of addressing the project purpose and need with fewer adverse environmental impacts has not been prematurely dismissed from consideration.

The Council on Environmental Quality (CEQ) regulations state that analyzing alternatives "is the heart of the environmental impact statement" (CEQ 1502.12). In accordance with the CEQ regulations and other applicable guidance regarding compliance with the National Environmental Policy Act (NEPA), a range of reasonable alternatives has been identified that may accomplish the objectives of the project. As stated in **Chapter 1, *Purpose and Need***, the purpose of this project is to provide RSAs at Kodiak Airport that meet current FAA standards to the extent practicable.

2.1 Range of Alternatives Considered

The CEQ regulations require that in the alternatives section of an Environmental Impact Statement (EIS), agencies "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated."[1] As explained by CEQ, "reasonable" alternatives "include those that are practical or feasible from the technical and economic standpoint and using common sense . . . "(CEQ 1981). An alternative is not reasonable if it would not meet the project's purpose and need.

***Alternatives**: NEPA documents examine reasonable alternatives that meet the purpose and need.*

[1] 40 CFR § 1502.14(a).

The CEQ regulations require the following regarding the analysis of alternatives in an EIS:

- Analysis shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment (CEQ 1502.1).
- The range of alternatives discussed in environmental impact statements shall encompass those to be considered by the ultimate agency decision maker (CEQ 1502.2(e)).
- Agencies shall include reasonable alternatives not within the jurisdiction of the lead agency (CEQ 1502.14(c)).
- Agencies shall include the alternative of No Action (CEQ 1502.14(d)).

As described earlier, this project is intended to address a specific purpose and need. This section describes the method by which alternatives were initially identified to meet that purpose and need. To ensure consideration of the possible range of alternatives, four primary types of alternatives were identified:

- **No Action.** Consideration of the alternative of not pursuing the proposed improvements is required by the CEQ regulations implementing NEPA. This alternative is the baseline to which the "action" alternatives are compared.
- **Use of smaller aircraft and other modes of travel.** This includes consideration of using smaller aircraft which do not require an expanded RSA, or reducing the use of the Airport by reducing air travel.
- **Use of other airports.** This involves consideration of reducing the need for improving the RSAs at Kodiak Airport by shifting operations or passengers to other area airports.
- **Physical airport improvements.** These alternatives consider different physical RSA improvements at Kodiak Airport to achieve the project purpose and need.

An initial review of the broad range of alternatives, encompassed within these four categories, was conducted to identify those alternatives that either were not feasible or did not meet the project purpose and need. Those alternatives were then eliminated from further evaluation.[2]

[2] For purposes of this evaluation, feasible is characterized as possible, based on sound engineering principles.

2.2 Initial Consideration of the Range of Alternatives

Based on the types of alternatives identified in the preceding sections, the FAA evaluated each alternative for feasibility and meeting the project's purpose and need. The following sections document that evaluation and the resulting identification of alternatives to be carried forward for further evaluation.

2.2.1 No Action

The No Action Alternative consists of the existing Kodiak Airport facilities with only limited improvements that have already been planned, FAA approved, and environmentally permitted. As the RSAs do not meet FAA standards, and no improvements to the RSAs would occur, the No Action Alternative would not meet the project purpose and need. However, the CEQ regulations require consideration of the No Action Alternative, so it is carried forward for evaluation. (**Section 2.3, *Summary of Alternatives Carried Forward for Evaluation***, provides an expanded definition of the No Action Alternative relative to the Kodiak Airport.)

2.2.2 Use of Smaller Aircraft and Other Modes of Travel

Use of smaller aircraft and alternative modes of transportation may provide other options to meet the air travel needs for passengers, freight shippers, and the USCG while reducing runway length requirements and corresponding RSAs for Runway 07/25 and Runway 18/36. As described in **Chapter 1, *Purpose and Need***, the design aircraft for Kodiak Airport is the Boeing 737-400 used by Alaska Airlines. If slower, smaller aircraft were used, the size of the RSAs might be reduced because the RSA dimensions for smaller, slower aircraft are less than those needed for larger, faster aircraft. However, if slower, smaller aircraft are used, it may be necessary to shift transportation demand towards rail, highway travel, and marine highway (water) travel to satisfy passenger demand and cargo demand that cannot be accommodated on smaller aircraft. The ability of such alternatives to provide realistic options for development at Kodiak Airport is largely dependent upon such factors as: 1) trip characteristics and travel needs of air passengers and freight shippers; 2) Alaska Airline's ability to use smaller aircraft; and, 3) the availability of other modes of transportation (highway, rail, etc.).

Use of Smaller Aircraft: The design aircraft at the Kodiak Airport is the Boeing 737-400. If this aircraft was replaced by smaller, slower aircraft, the required runway lengths and RSA dimensions would decrease. Although there has been a downturn in the economy, both the historic and forecast operations for the Airport include these larger aircraft.

Although a reduction in the aircraft size would decrease the required RSA dimensions, the FAA and ADOT&PF generally cannot limit or restrict the type of aircraft serving an airport where the airport meets certain design criteria and the operators of the aircraft desire to operate the aircraft at that airport. Additionally, Alaska Airlines does not have alternative slower, smaller aircraft suitable to accommodate the passengers and cargo served by the Boeing 737-400. This aircraft provides an important service to the community and other, smaller aircraft could not provide the same service. If the Boeing 737-400 or an equivalent aircraft no longer served Kodiak, the Airport would have less scheduled passenger air service capacity and air cargo shipments would be limited to fewer, smaller, and lighter items, thereby necessitating alternative means of transportation.

Highway (Auto/Bus) and Rail Travel: Kodiak Island is located on the eastern coast of the Alaska Peninsula, and is accessible only by air and by sea. Therefore, highway travel and rail service are not feasible alternatives.

Water Travel: The Alaska Marine Highway System's ferries provide year-round service for passengers and vehicles. A review of the Alaska Marine Highway System ferry schedule for the summer of 2012 indicates that an average of five ferries operate per week between Kodiak and other Alaska cities (Homer, Port Lions, and Seldovia), and to rural communities on a less frequent basis (Alaska Ferry 2012). Travel times on the ferry are over 15 hours to Seldovia, 12 hours to Homer, and three hours to Port Lions. Use of the ferry from Kodiak to Bellingham, Washington requires a connection in another city and is a multi-day trip. In comparison, flight times to and from Anchorage are approximately one hour, with connecting flights to other Alaska communities ranging from 25 minutes to two hours.

Because the City of Kodiak is on an island, it is only accessible by air and sea. Long travel times and limited ferry schedules prevent sea travel from being a feasible alternative to air travel.

Kodiak's residents and visitors currently have marine travel as a travel choice. To successfully compete with air travel, marine travel would need to be faster and less costly. Despite the availability of lower-cost ferry service, the success of air travel to and from Kodiak indicates an air-travel preference by many people. Based on the limitations of ferry-travel destinations as well as length of travel, it is not realistic that ferry service would provide a sufficient alternative to air travel to the extent that the larger commercial aircraft would no longer be needed at Kodiak Airport.

As stated above, based on CEQ guidance, the EIS should "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated" (CEQ 1502.14(a)). Based on the foregoing analysis, use of smaller aircraft and other modes of travel are not reasonable alternatives and therefore were eliminated from detailed study in this EIS.

2.2.3 Use of Other Airports

Within Kodiak Island Borough, there are 22 defined airports and seaplane bases. Of those, eight are land-based airports, including Akhiok, Karluk, Kodiak, Kodiak Municipal, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions. The nearest public use airport to Kodiak Airport is Kodiak Municipal Airport, which does not have scheduled commercial air service due to its limited airfield size and facilities. Homer is the nearest primary commercial service airport to Kodiak. It is located approximately 135 miles away (by air) and is only accessible from Kodiak Island by ferry or aircraft. The Homer Municipal Airport runway is only 2,475 feet long and is located in close proximity to residences. Other land-based airports are either not connected with the Kodiak road system or do not have the facilities to support commercial service with larger aircraft.

While it might be possible to use other airports in the Kodiak Island Borough, it would require air carrier passengers to travel to these other locations by water to begin or end their air travel. As noted above, water-based modes of travel are not feasible alternatives. Therefore, this alternative was eliminated from detailed study in this EIS.

2.2.4 RSA Improvements

This section describes various options for improving RSAs at Kodiak Airport to fully meet FAA standards.

Based on the design aircraft for the Airport, the Boeing 737-400, FAA standards require an RSA that is 500 feet wide (centered on the runway) and that extends 1,000 feet beyond each runway end (AC 150/5300-13). The current RSAs at Kodiak Airport for Runways 07/25 and 18/36 do not meet these standards because they have insufficient RSA beyond each of the runway ends.

The following types of alternatives are considered when addressing improvements to RSAs that do not meet FAA standards (see FAA Order 5200.8, *Runway Safety Area Program*):

- Construction of traditional graded areas surrounding the runway.
- Relocation—changing the location of the runway.
- Shifting—changing the arrival/departure runway ends by adding new landmass on one or both ends.

- Re-alignment—changing the direction of the runway centerline of the runway while maintaining runway length.
- A combination of runway relocation, shifting, and grading.
- Reduction in the runway length where existing runway length exceeds that which is required for the existing or projected design aircraft. Reducing declared distances—declared distances are the distances the Airport owner declares and the FAA approves as available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements (see **Section 2.2.5).**
- Engineered Materials Arresting Systems (EMAS)–EMAS is made of crushable concrete blocks placed at the end of the runway that are used for stopping aircraft.

Each of these options is discussed below.

2.2.5 RSA Improvement Options

The following sections describe options for improving the RSAs for Runway 07/25 and Runway 18/36 to fully meet FAA standards. As explained below, none of these options is practicable. From these options, however, specific alternatives were developed as described in **Section 2.4**, ***Alternatives Carried Forward for Further Evaluation***.

Grade-and-Fill: This grade-and-fill option would entail placing fill beyond the runway ends in St. Paul Harbor to the east and tunneling Chiniak Highway under the new RSA[3] to provide the required 1,000 feet of RSA beyond the existing runway ends. This option would require the placement of fill beyond Runway end 25, Runway end 18, and Runway end 36 as well as the relocation or tunneling of Chiniak Highway beyond Runway end 07. Fill material would be placed in St. Paul Harbor to the east beyond Runway end 25, Runway end 18, and Runway end 36. To fully meet FAA standards for Runway 07/25, the estimated cost of this option with tunneling would be approximately $78.5 million. To fully meet FAA standards for Runway 18/36, the estimated cost of this option would be approximately $54.7 million. The FAA has determined that the maximum feasible RSA improvement cost for Kodiak Airport is approximately $25 million each for Runway 07/25 and Runway 18/36. Therefore, fully meeting FAA standards with this option is not practicable.

[3] Except for tunneling, relocating Chiniak Highway to the west is not possible due to the location of a Runway 07/25 aircraft navigation aid on the adjacent hillside. The navigation aid, a localizer, must have an unobstructed line-of-site over roadway to the runway. The relocation of the roadway above surface would cause a disruption to the siting and use of the runway localizer. Use of a tunnel could allow the traffic to proceed under the Runway 07/25 RSA and not disrupt the localizer; however the construction and operation of a tunnel for Chiniak Highway is not considered practicable because the local terrain (the proximity to Barometer Mountain to the west) would result in roadway realignment issues and high costs.

Relocation or re-aligning the runways (while maintaining runway length): Runway relocation (moving the runway entirely) and re-alignment (changing the direction of the runway centerline) are often worth considering as a way to improve RSAs. However, Kodiak Airport has natural physical barriers constraining runway location changes. St. Paul Harbor is to the east of the Airport, Barometer Mountain is to the west, and Buskin River is to the north. In addition, USCG facilities are south of the Airport. Because of these constraints, insufficient landmass exists at Kodiak Airport for the runways to be feasibly re-aligned or relocated within the physical and financial constraints such that the runway length is maintained while providing RSA improvements. As such, relocation or re-alignment of the runways on existing landmass would not be a reasonable alternative.

Reduction of runway length: If an existing runway length exceeds that which is required for the existing or projected design aircraft, a runway could perhaps be shortened and the vacated pavement could serve in meeting the RSA needs. To achieve a 1,000-ft RSA off the end of each runway end, Runway 07/25 would need to be shortened by a total of 2,000 feet (1,000 feet from each end), leaving 5,542 feet of runway. Runway 18/36 also would need to be shortened by a total of 2,000 feet (1,000 feet from each end) leaving 3,013 feet of available runway.

To determine if a shortened runway would still meet the requirements of aircraft using Kodiak Airport, a runway length analysis was conducted for Kodiak Airport to determine if the existing runway length exceeds the length required for the existing or projected design aircraft.

The specified critical aircraft for takeoffs was identified as the Boeing 737-400. According to data provided by Alaska Airlines, this aircraft requires a takeoff length of 6,547 feet for typical operating conditions. The USCG's Lockheed Martin HC-130 is the most demanding for landings, requiring as much as 7,800 feet during tailwind landings at a typical mission weight of 150,000 pounds. Also, under contaminated runway/poor braking conditions, such as water or ice on the runway, a fully loaded Boeing 737-400 aircraft requires 7,876 feet of landing length. Therefore, the existing length of Runway 07/25 (7,542 feet) or Runway 18/36 (5,013 feet) does not exceed the length required for the design aircraft at Kodiak Airport.

Based on coordination with the airport users, including Alaska Airlines, ERA Airlines, and the USCG, the design aircraft are expected to stay the same in future conditions and the HC-130 will remain in service over the planning period. Additionally, the **2003 Vision 100/Century of Aviation Reauthorization Act** states:

> An airport owner or operator in the State of Alaska shall not be required to reduce the length of a runway or declare the length of a runway to be less than the actual pavement length in order to meet standards of the Federal Aviation Administration applicable to runway safety areas. (*PL 108-176, Section 502*)

Based on the factors discussed above, and given the importance of commercial air service to the Kodiak area, reduction of runway length is not a reasonable alternative.

It is also important to note that the runway length required for the design aircraft is separate from the RSA requirements. If an aircraft requires 7,800 feet to land, extending the runway from 7,542 feet to 7,800 feet does not meet RSA requirements. RSAs are additional safety areas off the side and end of the runway in the event of overruns or undershoots (i.e. deviations from the normal conditions that runway length requirements are based upon). **Table 2-1** provides the RSA and runway length standards for Runway 07/25 and Runway 18/36.

TABLE 2-1
RUNWAY SAFETY AREA AND LENGTH STANDARDS

Rwy	RSA overrun length standard	RSA undershoot length standard	RSA width standard	Existing Runway Length	Recommended All-Weather Runway Length 737-400	Recommended All-Weather Runway Length HC-130	Available Length to Shorten Runway to Meet RSA?
Rwy 18/36	1,000 ft	600 ft	500 ft	5,013 ft	7,876 ft	7,800 ft	No
Rwy 07/25	1,000 ft	600 ft	500 ft	7,542 ft	7,876 ft	7,800 ft	No

A Combination of Runway Relocation, Shifting, Grading, Realignment, or Reduction: Because the relocation and realignment of runways and reduction of runway length are not practicable, a combination of those options would not be a reasonable alternative. However, options that combine runway shifts (e.g., keeping runway alignment but shifting Runway 18/36 north or south and/or shifting Runway 07/25 east or west) with filling and grading of new landmass are worthy of further consideration to enhance RSAs.

The option of combining shifting and filling/grading is different from those discussed in the prior paragraphs, as the runway landmass could be extended into St. Paul Harbor while retaining the existing runway lengths for Runway 07/25 and 18/36. Options were considered for each runway, as follows:

Runway 07/25 – This runway cannot be relocated laterally (i.e. moved north or south) because of existing airport facilities (terminal and support facilities) and the Buskin River to the north, as well as high terrain and the USCG Base to the south.

Runway 07/25 cannot be shifted to the west due to the presence of Barometer Mountain. Moving toward Barometer Mountain would not only bring operations closer to this obstruction but could also have a negative impact on the approach minimums to Runway 25. Approach minimums are the minimum ceiling or visibility under which an aircraft can land. If an approach minimum increases, the ceiling must be higher, therefore decreasing the percent of time that aircraft are able to land during inclement weather.

Similarly, the runway cannot feasibly be shifted to the east into St. Paul Harbor because of adverse impacts to the Airport's navigational aids, as well as the increase in potential for obstructions from transient vessels in St. Paul Harbor. In addition to these challenges, this option would require the construction of a 2,000-foot long by 500-foot wide landmass extension beyond Runway end 25to meet FAA RSA standards.

In this scenario, Runway 07/25 would be shifted by 1,000 feet to the east, the shifted portion of the runway would meet RSA needs on the west, and the new landmass would meet RSA needs on the east. This would meet all FAA design standards. However, it is estimated that shifting Runway 07/25 to the east to provide a standard RSA would cost approximately $65 million. Because of the high cost, shifting the runway combined with filling to fully meet FAA standards for RSAs would not be practicable. Non-standard RSA options for this runway are discussed later to enhance safety by increasing the size of the RSA incrementally.

Runway 18/36 – Lateral relocation of Runway 18/36 to achieve RSA standards is not considered feasible due to topographical constraints surrounding the Kodiak Airport, including Barometer Mountain to the west and St. Paul Harbor to the east. High terrain and surrounding land uses including the USCG Base also prevent the realignment or relocation of Runway 18/36.

The Buskin River and high terrain north of the Airport and the USCG Base south of the Airport constrain the limits of both landmass extension and runway shifts. It is estimated that shifting Runway 18/36 to meet full RSA standards would cost somewhere between $55 and $75 million. For these reasons, using this option would not be a practicable way to achieve full compliance with FAA RSA standards.

Non-standard RSA options for this runway may enhance safety by increasing the size of the RSA incrementally. These options are discussed later.

Declared distances: As noted earlier, declared distances are the distances the Airport owner declares and the FAA approves as available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements. These distances are defined as follows:

Declared distances: *Distances approved by the FAA as available for takeoff and landing on a runway.*

- Takeoff run available (TORA) – the runway length declared available and suitable for the ground run of an airplane taking off;
- Takeoff distance available (TODA) – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA
- Accelerate-stop distance available (ASDA) – the runway plus stopway (area beyond the takeoff runway to support the aircraft during an aborted takeoff) length declared available and suitable for the acceleration and deceleration of an airplane aborting a takeoff; and
- Landing distance available (LDA) – the runway length declared available and suitable for a landing airplane.

According to FAA guidance in **Advisory Circular 150/5300-13 *Airport Design***, the alternative of using declared distances to achieve compliance with specified airport design criteria "shall be limited to cases of existing constrained airports where it is impractical to provide the runway safety area (RSA), the runway object free area (ROFA), or the runway protection zone (RPZ)" in accordance with specified FAA design standards." Because of the types of aircraft operating at Kodiak Airport, this option would need to maintain existing runway lengths, and could be combined with shifting the runway and grading/filling. Given the limited landmass at Kodiak Airport, the declared distance options would need to be combined with other techniques, such as additional landmass construction, discussed above.

However, because of existing mountainous terrain that results in obstructions to the approach and departure surfaces for all of the runways at Kodiak Airport (areas identified as needing to be clear of obstacles and obstructions to aircraft), the use of declared distances would likely result in a reduction in usability of the runways during poor weather, thereby limiting air service. Therefore, the use of declared distances is not practicable for either Runway 07/25 or Runway 18/36.

Engineered Materials Arresting Systems (EMAS):

EMAS was developed by the FAA in concert with the University of Dayton, the Port Authority of New York and New Jersey and the Engineered Arresting Systems Corporation specifically for airports where standard RSAs cannot feasibly be developed off the runway ends, but where this technology can be used to slow or arrest the movement of aircraft. EMAS consists of a number of pre-cast, crushable, cellular cement blocks installed at the end of the runway. As an aircraft traverses the first row of "lead-in" blocks in the EMAS bed, they begin to crush. Increased rolling resistance of aircraft tires crushing down and through the arresting material causes a deceleration or slowing of the aircraft.

The Engineered Materials Arresting System at John F. Kennedy International Airport successfully stopped this cargo plane on May 30, 2003. It also successfully stopped a commuter plane in 1999.

Photo credit: Courtesy of the Port Authority of New York and New Jersey

The specific standards for these blocks and how many should be installed are based on the types of aircraft operating at an airport. An EMAS bed, providing an equivalent level of safety to a 1,000 feet standard RSA, would need to arrest the design aircraft (737-400) entering the system at 70 knots and prevent the aircraft from exiting the far end of the EMAS bed.

***EMAS**: Engineered Materials Arresting System*

EMAS has been installed at a number of airports in the U.S. with varying climatic conditions, including Cordova Airport in Alaska. As of June 2012, there were more than 58 EMAS installations at airports located across the U.S. and five international installations. Some of the EMAS installations include designs that do not achieve 70-knot stopping capability and several of the airports are located in cold and wet environments similar to Kodiak. Several of the early EMAS installations experienced problems with moisture infiltration, and the manufacturer has maintained a continuous program of research and development to improve the product's durability and water resistance characteristics.

The FAA has now developed guidance concerning EMAS and its potential application in lieu of standard RSAs (see **FAA Order 5200.9, Financial Feasibility and Equivalency of Runway Safety Area**). After years of testing and analysis, the FAA has determined that EMAS can be constructed to provide a level of overshoot/overrun safety generally equivalent to a standard RSA. For the runways at Kodiak Airport to meet FAA design standards with the use of EMAS, there must also be 600 feet of RSA to protect aircraft landing short of the runway. Given EMAS requirements, the following alternatives were considered for each runway.

Runway 07/25 – An EMAS designed to achieve FAA RSA standards for Runway 07/25 would require the construction of a 600-foot long by 500-foot wide landmass off Runway end 25 with a 385-foot by 170-foot EMAS bed installed at the east end of the landmass. On the Runway end 07 side, the Chiniak Highway to the west would need to relocated or tunneled and a 385-foot by 170-foot EMAS bed would need to be installed at the Runway end. An EMAS installation for Runway 07/25 that would meet FAA standards on both runway ends would cost approximately $54 million. Because of the high cost, such an installation would not be practicable. However, non-standard EMAS alternatives are examined in **Section 2.4** below.

Runway 18/36 – An EMAS designed to achieve FAA RSA standards for Runway 18/36 would require the construction of a 600-foot long by 500-foot wide landmass off both runway ends to the north and south with a 385-foot by 170-foot EMAS bed installed at the end of the landmasses. An EMAS installation for Runway 18/36 that would meet FAA standards on both runway ends would cost approximately $62.6 million. Because of the high cost, such an installation would not be practicable. However, non-standard EMAS and fill alternatives are examined in **Section 2.4** below.

Practicability of RSA Improvement Options for Fully Meeting FAA Standards

As explained above, it is not practicable to improve the RSAs for Runway 07/25 and Runway 18/36 to fully meet FAA standards. However, as noted above, there are RSA improvement options that could provide a meaningful safety enhancement to the existing runways. Of these options, there are three (grade and fill, shifting of Runway 18/36, and use of EMAS) that would be practicable to be incorporated into project alternatives that do not fully meet FAA standards. The following sections describe how these options were considered in developing reasonable alternatives for further evaluation in this EIS. When developing the alternatives, the FAA evaluated various factors including existing runway use, instrument approach capabilities, and aircraft accident and fatality data involving takeoffs and landings for both commercial service and general aviation aircraft to establish RSA safety priorities for Kodiak Airport.

2.3 Additional Considerations in Developing Alternatives

While RSA design standards are dictated by the largest and fastest aircraft regularly operating on a runway, it should be recognized that many of the aircraft using the runway are often smaller in size and do not require the same RSA. FAA RSA design standards are based on Approach Categories, which are based on the speed/landing weight of an aircraft. For Approach Category A & B, aircraft RSA undershoot and overrun protection at Kodiak Airport is 240 feet for Design Group I aircraft (small general aviation aircraft), 300 feet for Design Group II aircraft (medium sized general aviation aircraft), and 600 feet for Design Group III and IV (large general aviation aircraft and smaller commercial aircraft) (AC 150/5300-13). The RSA design standard dimensions for Approach Category C & D aircraft (larger, faster commercial aircraft) RSA undershoot protection is 600 feet and overrun protection is 1,000 feet.

While the RSA standard for both Runway 07/25 and Runway 18/36 is 500 feet wide extending 1,000 feet beyond each runway end, consideration of the aircraft utilization of each runway end at Kodiak Airport is important in assessing RSA improvements at each end to maximize the safety benefits. For instance, as noted earlier, the Alaska Airlines Boeing 737-400 aircraft primarily uses Runway end 25, Runway end 07 and occasionally Runway end 36. That aircraft rarely uses Runway end 18, which is primarily used by smaller aircraft. Similarly, the ERA Aviation Dash-8 aircraft, which has a smaller RSA standard, primarily uses Runway end 25, Runway end 07 and occasionally Runway ends 36 and 18 (ATCT data 2010).

Based upon the Runway 18/36 usage by a variety of aircraft types in both directions, the FAA has determined that it is reasonable to provide overrun and undershoot protection for both ends of Runway 18/36 of at least 240 feet for smaller aircraft. By providing 240 feet of RSA beyond each runway end, all alternatives would meet FAA RSA standards for the aircraft type using the runway most often and would provide a minimum level of improvement for all aircraft types.

2.3.1 RSA Improvement Alternative Concepts

While not fully achieving RSA standards, several alternatives would increase the size of the RSA and thereby incrementally enhance safety. They can be grouped into one of the following categories:

Runway 07/25:

Concept 1 – Incremental landmass expansion to the east with and without EMAS (increasing the Runway end 25 RSA).

Runway 18/36:
Concept 1 - Incremental landmass expansion to the south and north with and without EMAS (increasing both the Runway end 18 and Runway end 36 RSA).

Concept 2 - Incremental landmass expansion to the south with and without EMAS and a corresponding shift in the runway to the south (increasing the Runway end 18 and Runway end 36 RSA by building to the south and shifting the runway south).

A range of the above combinations exist that could be completed within the financial feasibility thresholds for each runway, making a selection within this range practicable. **Section 2.4** identifies the specific RSA alternatives carried forward for detailed analysis. In each case, the alternatives enhance safety to the extent practicable and include the placement of fill into marine waters to create additional landmass.

2.3.2 RSA Improvement Priorities

Existing runway use is dictated by the runway's existing wind coverage and instrument approach capabilities. In the *Runway Safety Area Planning Memorandum*, runway use was examined along with the aircraft accident and fatality data correlated to the flight phase (i.e. takeoffs vs. landings) for both commercial service and general aviation aircraft to determine RSA improvement priorities. As a result, the RSA enhancements at Kodiak Airport are ranked as follows:

Runway 07/25 Priorities*:*

1) Runway 07 overrun RSA (Runway end 25 RSA)
2) Runway 25 undershoot RSA (Runway end 25 RSA)
3) Runway 25 overrun RSA (Runway end 07 RSA)

Runway 18/36 Priorities:

1) Runway 36 overrun RSA (Runway end 18 RSA)
2) Runway 36 undershoot RSA (Runway end 36 RSA)
3) Runway 18 overrun RSA (Runway end 36 RSA)
4) Runway 18 undershoot RSA (Runway end 18 RSA)

This prioritization was used in developing alternatives considered for this EIS.

2.3.3 RSA Construction Options

Construction options available to expand the landmass necessary for RSA improvements in the marine environment include:

- **Placement of fill and armor rock.** This option would place fill and armor rock at a 2:1 slope off the existing filled surfaces to provide a structurally stable top surface for RSA improvements.
- **Placement of sheet piles.** This option would use a perimeter of vertical sheet piles to support the fill material needed for a structurally stable top surface for RSA improvements. This option is not feasible due to costs as well as wave action and storm surge and the inability of the structures to withstand such forces over the typical airport design period (20 years). Placing the sheet pile wall would increase the water overtopping onto the RSA and runway. In addition, the life expectancy of the wall may not be as long due to the corrosive saltwater environment. Based on these factors, this is not a feasible option.
- **Placement of RSA on pillar piles.** This option would build a structure for RSA surfaces over pillar piles, similar to a bridge structure. This option is not feasible due to exposure to wave action, storm surge influences, and cost.

The conclusion of the review of RSA construction alternatives is that the only feasible option is placement of fill and armor rock. The analysis in this EIS evaluates a 2:1 slope; which, based on preliminary designs, is the steepest feasible slope.

2.4 Alternatives Carried Forward for Further Evaluation

This section briefly describes the RSA improvements, cost considerations, environmental considerations, and ability to meet project purpose and need for the alternatives developed to enhance the RSAs at Kodiak Airport. The comparison of environmental impacts summarized in this section (and in **Table 2-3**) highlights material differences among the alternatives in key impact categories; these impacts are detailed in **Chapter 4, Environmental Consequences.** The range of RSA alternatives represents various combinations of the RSA improvement options discussed above.

The following alternatives examine landmass increases for each of the runway ends to assess their ability to meet the project need. As described in earlier sections, RSA improvements are limited to those that grade and fill into marine water beyond Runway 07 for Runway 07/25 and Runway end 18 and Runway end 36 for Runway 18/36.

The Build Alternatives described below include grade and fill into marine waters, with some of the alternatives incorporating EMAS. Consistent with the project purpose and need, these alternatives are designed to maximize RSA improvements within the FAA's cost limit. The No Action alternative is included as required by the CEQ regulations.

2.4.1 Runway 07/25 RSA Alternatives.

The following alternatives were developed for the proposed RSA improvements to Runway 07/25 at Kodiak Airport.

Runway 07/25 Alternative 1 - No Action

No Action Alternative: CEQ regulations require that the No Action Alternative always be carried forward into the analysis of a NEPA document.

Figure 2-1 shows the Runway 07/25 Alternative 1 - No Action Alternative. The No Action Alternative would retain the Runway 07/25 RSAs in their current non-standard dimensions with no RSA improvements. Overrun and undershoot protection for Runway end 25 would remain at 0 feet, overrun protection for Runway end 07 would remain at 0 feet, and undershoot protection for Runway end 07 would remain at 1,000 feet. Because no additional safety area would be constructed, this alternative would provide no safety benefit. No changes in landing or takeoff position would occur with the No Action Alternative, meaning that no changes in airport efficiency would occur. The lack of RSA-related construction means there would be no adverse environmental impacts or socioeconomic impacts. No enhancements in airfield safety would occur with the No Action Alternative. In keeping with CEQ regulations, this alternative was retained for analysis in the EIS.

Runway 07/25 Alternative 2 – Extend Runway 25 RSA landmass by 600 feet and install 70-kt EMAS on newly constructed landmass

Runway 07/25 Alternative 2 would enhance the RSA at the east end of the runway through an extension into St. Paul Harbor to the east and the use of EMAS. Fill would be placed off Runway end 25 to create a landmass 600 feet long by 500 feet wide. The Airport's existing runway length of 7,542 feet would be maintained. The Runway end 25 EMAS bed would be approximately 170 feet wide and 385 feet long, installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The site design would also include sufficient area around the perimeter of the EMAS bed footprint to allow emergency vehicle access. **Figure 2-2** illustrates this alternative.

The EMAS would provide a 70-knot stopping capability on Runway end 25 for the runway's design aircraft. The existing RSA would be enhanced for aircraft overruns on Runway end 25 (i.e. for takeoffs to the east), the primary operational flow of the Airport for departures, providing an equivalent level of safety for aircraft overruns as that offered by a traditional graded 1,000-foot RSA. The expanded landmass beyond Runway end 25 would also meet FAA standards for undershoots by providing 600 feet of RSA.

The cost of this alternative is estimated to be $22 million. The runway's existing takeoff and landing distances would be maintained for each runway use configuration, and the specified declared distances would be the same as those currently in place at Kodiak Airport.

Approximately 256,932 cubic yards of fill would be required to construct the new landmass needed to support the EMAS. The primary environmental impacts related to Runway 07/25 Alternative 2 would be associated with the loss of marine habitat from the placement of this fill to construct a 600-foot landmass expansion on Runway end 25 (see **Figure 2-2)**.

Runway 07/25 Alternative 3 – Extend Runway 25 RSA landmass by 1,000 feet

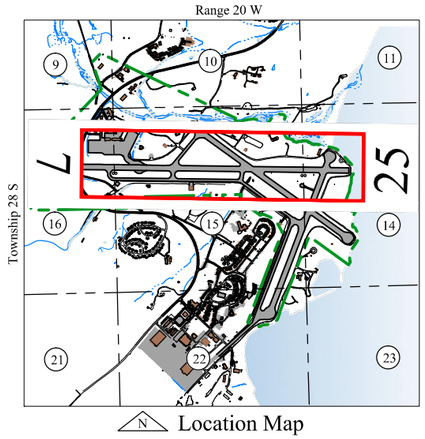
This alternative would improve the RSA for overruns during takeoff and undershoot during landings for Runway end 25. Fill would be placed beyond Runway end 25 to the east to create a landmass 1,000 feet long by 500 feet wide. Runway 07/25 Alternative 3 is shown in **Figure 2-3**.

The existing runway length of 7,542 feet would be maintained in its current configuration. This alternative would meet FAA standards for RSA for Runway end 25 by providing 1,000 feet of overrun protection for takeoffs to the east and undershoot protection (400 feet more than the 600 foot standard) for landings from the east. The cost of this alternative is estimated at about $20 million.

Approximately 455,158 cubic yards of fill would be required to construct the new runway extension and RSA. The primary environmental impacts related to Runway 07/25 Alternative 3 would be associated with the loss of marine habitat from the placement of fill to construct an 1,000-foot landmass expansion to Runway end 25 (see **Figure 2-3)**.

Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 7	1,129'/1,129'	0'/0'
Runway 25	0'/0'	0'/0'



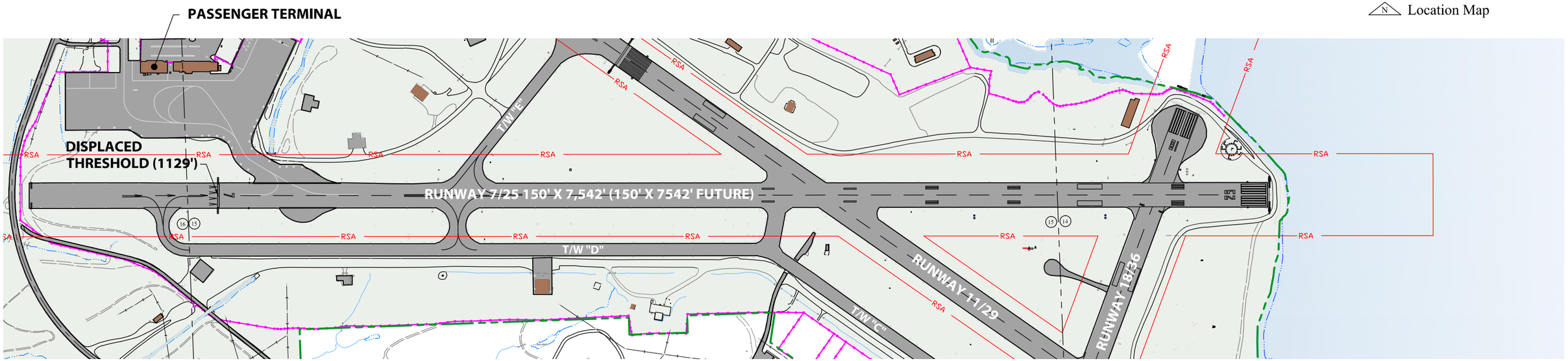


Figure 2-1 **RW 7/25 Alternative 1 No Action**

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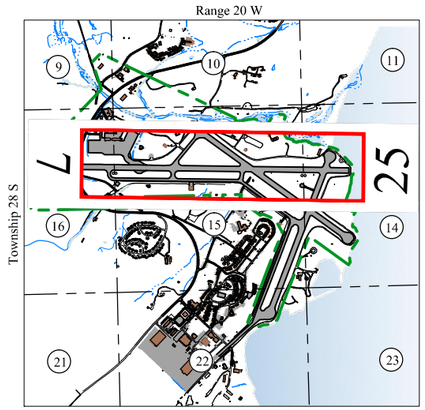
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 7	1,129'/1,129'	0'/600' (1)
Runway 25	0'/600' (1)	0'/0'

(1) Dimension includes EMAS bed length.



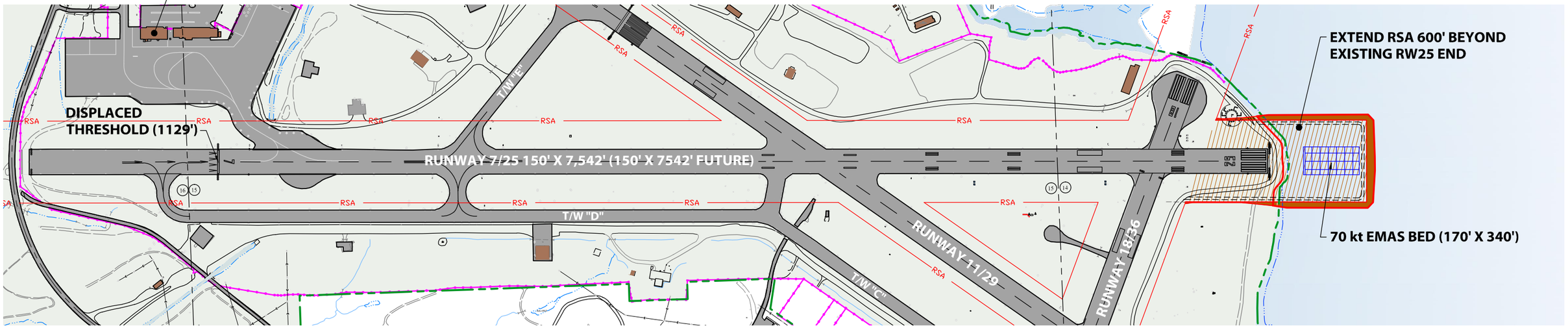


Figure 2-2 **RW 7/25 Alternative 2 Extend RSA landmass by 600 feet and install 70kt EMAS on newly constructed landmass**

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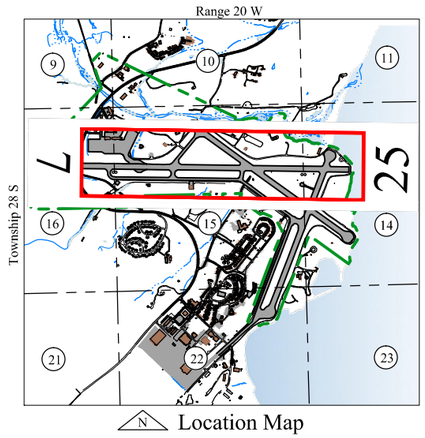
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 7	1,129'/1,129'	0'/1000'
Runway 25	0'/1000'	0'/0'



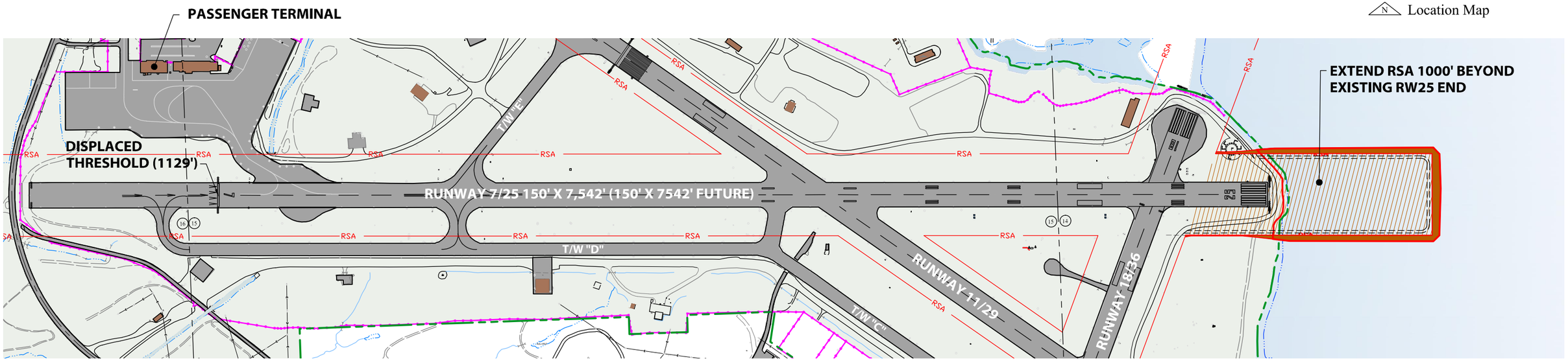


Figure 2-3 **RW 7/25 Alternative 3**
Extend RSA landmass by 1000 feet

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2.4.2 Runway 18/36 RSA Alternatives.

The following alternatives were developed for the proposed RSA improvements to Runway 18/36 at Kodiak Airport. The range of alternatives below includes alternatives that provide RSA improvements to both runway ends with and without the use of EMAS.

Runway 18/36 Alternative 1 – No Action

Figure 2-4 illustrates Runway 18/36 Alternative 1 - No Action Alternative. The No Action Alternative would retain the Runway 18/36 RSAs at their current non-standard dimensional status with no improvements. Overrun/undershoot protection for Runway end 18 would remain at 0 feet and overrun/undershoot for Runway end 36 would remain at 0 feet. No changes in landing or takeoff positions would occur with the No Action Alternative, reflecting no changes in airport efficiency. The lack of RSA-related construction means there would be no new environmental impacts or socioeconomic impacts. No enhancements in airfield safety would occur with the No Action Alternative.

Runway 18/36 Alternative 2 – Extend RSA to the south by 600 feet, to the north by 240 feet and install 40-kt EMAS on newly constructed landmass (north)

Runway 18/36 Alternative 2 would enhance the RSA at the south end of the runway through a 600-foot extension south into St. Paul Harbor and would enhance the RSA at the north end of the runway through a 240-foot extension into St. Paul Harbor and the use of EMAS. The existing runway length of 5,013 feet would be maintained. The Runway end 18 EMAS bed would be approximately 170 feet wide and 165 feet long, installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The site design would also include sufficient area around the perimeter of the EMAS bed footprint to allow emergency vehicle access. **Figure 2-5** illustrates this alternative.

The EMAS would provide a 40-knot stopping capability on Runway end 18 for the runway's design aircraft. The existing RSA would be enhanced for aircraft overruns on Runway end 18 (i.e. for takeoffs to the north and landings from the south), the primary operational flow of the runway for departures. The expanded landmass on Runway end 18 would also enhance the RSA undershoot dimension for landings from the north by 240 feet. This is an increase from the existing 0 feet but still 360 feet less than FAA standards. This alternative would provide a 600-foot RSA enhancement beyond Runway end 36; therefore providing overrun for takeoffs and landings to the south and meeting FAA standards for undershoot protection for landings from the south.

The cost of this alternative is estimated to be $27 million. The runway's existing takeoff and landing distances would be maintained for each runway use configuration.

Approximately 517,354 cubic yards of fill would be required to construct the new landmasses. The primary environmental impacts related to Runway 18/36 Alternative 2 would be associated with the loss of marine habitat from the placement of this fill (see **Figure 2-5)**. This alternative would place the majority of fill to the south with a smaller fill footprint toward the Buskin River at the north end of the runway.

Runway 18/36 Alternative 3 – Extend RSA south by 240 feet, north by 450 feet and install 70-kt EMAS (north)

Runway 18/36 Alternative 3 would enhance the RSA at the south end of the runway through a 240-foot extension into St. Paul Harbor and would enhance the RSA at the north end of the runway through a 450-foot extension into St. Paul Harbor and the use of EMAS. The existing runway length of 5,013 feet would be maintained. The Runway end 18 EMAS bed would be approximately 170 feet wide and 385 feet long, installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The site design would also include sufficient area around the perimeter of the EMAS bed footprint to allow emergency vehicle access. **Figure 2-6** illustrates this alternative.

The EMAS would provide a 70-knot stopping capability on Runway end 18 for the runway's design aircraft. The existing RSA would be enhanced for aircraft overruns on Runway end 18 (i.e. for takeoffs to the north and landings from the south), the primary operational flow of the runway, providing an equivalent level of safety for aircraft overruns as that offered by a traditional graded 1,000-foot RSA and meeting FAA standard for overrun protection. The expanded landmass on Runway end 18 would also enhance the RSA undershoot dimension by 450 feet for landings from the north. This is more than the existing 0 feet but still 150 less than FAA standards for landings from the north. This alternative would provide 240 feet of RSA enhancement beyond Runway end 36; providing the minimum protection for landings from the south or overrun for takeoffs to the south.

The cost of this alternative is estimated to be $24 million. The runway's existing takeoff and landing distances would be maintained for each runway use configuration.

Approximately 289,049 cubic yards of fill would be required to construct the new landmass needed to support the EMAS. The primary environmental impacts related the alternative would be associated with the loss of marine habitat from the placement of fill (see **Figure 2-6)**. This alternative would place a greater amount of fill to the north (toward the Buskin River) than to the south of the runway.

Runway 18/36 Alternative 4 – Extend RSA to north and south by 300 feet and install 40-kt EMAS (both ends)

This alternative would enhance the RSA at each end of Runway 18/36 through extensions of the landmasses at both ends of the runway into St. Paul Harbor. Fill would be placed beyond both the north and south ends of the runway to create two landmasses 300 feet long by 500 feet wide at each runway end for a total of 600 additional feet. An EMAS bed approximately 170 feet wide and 165 feet long would be placed beyond each runway end, installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The site design would also include sufficient area around the perimeter of the EMAS bed footprint to allow emergency vehicle access. The EMAS beds would provide a 40-knot stopping capability on both runway ends for the runway's design aircraft. **Figure 2-7** illustrates this alternative.

The existing runway pavement length of 5,013 feet would remain unchanged and the runway end thresholds would remain in their current locations. 300 feet of undershoot protection would be provided on each runway end. The cost of this alternative is estimated to be about $24 million.

Approximately 286,248 cubic yards of fill would be required to construct the new 300-foot landmass added to each runway end. The primary environmental impacts related the alternative would be associated with the loss of marine habitat from the placement of fill (see **Figure 2-7)**. Fill to the north (toward the Buskin River) and south would be balanced.

Runway 18/36 Alternative 5 – Extend RSA to north and south by 600 feet

This alternative would enhance the RSA at each end of Runway 18/36 through extensions of the landmasses at both ends of the runway into St. Paul Harbor. Fill would be placed off both the north and south ends of the runway to create two landmasses 600 feet long by 500 feet wide beyond each runway end for a total of 1,200 additional feet. Runway 18/36 Alternative 5 is shown in **Figure 2-8**.

The existing runway pavement length of 5,013 feet would remain unchanged and the runway end thresholds would remain in their current locations. 600 feet of overrun and undershoot protection would be provided on each runway end. This alternative would meet FAA standards for RSA undershoot protection but would be 400 feet less than the FAA standard 1,000 feet for overrun protection. The cost of this alternative is estimated to be about $27 million.

Approximately 630,235 cubic yards of fill would be required to construct the new 600-foot landmasses added to each runway end. The primary environmental impacts related to Runway 18/36 Alternative 5 would be associated with the loss of marine habitat from the placement of fill (see **Figure 2-8)**. This alternative would place the greatest amount of fill to the north toward the Buskin River.

Runway 18/36 Alternative 6 – Extend RSA to south by 400 feet and to north by 240 feet and install 40-kt EMAS (both ends)

Runway 18/36 Alternative 6 would enhance the RSA at the north end of the runway through a 240-foot extension into St. Paul Harbor and the use of EMAS. This alternative would also enhance the RSA at the south end of the runway through a 400-foot extension into St. Paul Harbor and the use of EMAS. The existing runway length of 5,013 feet would be maintained. An EMAS bed approximately 170 feet wide and 165 feet long would be placed beyond each runway end, installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The site design would also include sufficient area around the perimeter of the EMAS bed footprint to allow emergency vehicle access. The EMAS beds would provide a 40-knot stopping capability on Runway end 18 for the runway's design aircraft. **Figure 2-9** illustrates this alternative.

The existing RSA would be enhanced for aircraft overruns on Runway end 18 (i.e. for takeoffs to the north and landings from the south), the primary operational flow of the runway for departures. The expanded landmass on Runway end 18 would also enhance the RSA undershoot dimension by 240 feet for landings from the north. This is more than the existing 0 feet but 360 feet less than the FAA's standard requirement. This alternative would provide a 400-foot RSA enhancement beyond Runway end 36; thereby providing improvement to undershoot protection for landings from the south and overrun for takeoffs and landings to the south.

The cost of this alternative is estimated to be $26 million. The runway's existing takeoff and landing distances would be maintained for each runway use configuration.
Approximately 347,625 cubic yards of fill would be required to construct the new landmasses. The primary environmental impacts related to this alternative would be associated with the loss of marine habitat from the placement of fill (see **Figure 2-9)**.

Runway 18/36 Alternative 7 – Extend RSA to south by 600 feet, shift runway south 240 feet, and install 40-kt EMAS on existing pavement (north)

Runway 18/36 Alternative 7 would enhance the RSA at the north and south end of Runway 18/36 through a 600-foot long by 500-foot wide landmass extension at the south, beyond Runway end 36 and shifting the runway 240 feet to the south. An EMAS bed approximately 170 feet wide and 165 feet long would be placed beyond Runway end 18 (north), installed on pavement with a minimum setback of 35 feet from the runway threshold (final setback would be based upon final design). The EMAS bed would provide a 40-knot stopping capability on Runway end 18 for the runway's design aircraft. Runway 18/36 Alternative 6 is shown in **Figure 2-10**.

The existing runway length of 5,013 feet would not change but the runway end thresholds would be shifted 240 feet south of their current locations. This alternative would provide 360 feet of undershoot protection for landings from the south to Runway end 36 and 240 feet of undershoot protection for landings from the north to Runway end 18. This alternative would provide 40-knot stopping capability for overruns beyond Runway end 18 and would be provide 360 feet of overrun protection for landings and takeoffs to the south. The cost of this alternative is estimated to be $27 million.

Approximately 462,081 cubic yards of fill would be required to construct the new 600-foot landmass extension to the south beyond Runway end 36, shift the runway 240 feet, and install a 40-knot EMAS beyond the north end of the runway. The primary environmental impacts related the alternative would be associated with the loss of marine habitat from the placement of fill (see **Figure 2-10)**. This alternative is the only one that would not place any fill north of the runway toward the Buskin River.

Table 2-2, **Initial Range of Alternatives Summary**, provides an overview of each of the above alternatives and their key components.

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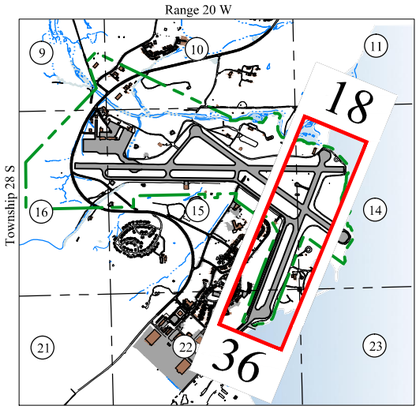
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/0'	0'/0'
Runway 36	0'/0'	0'/0'



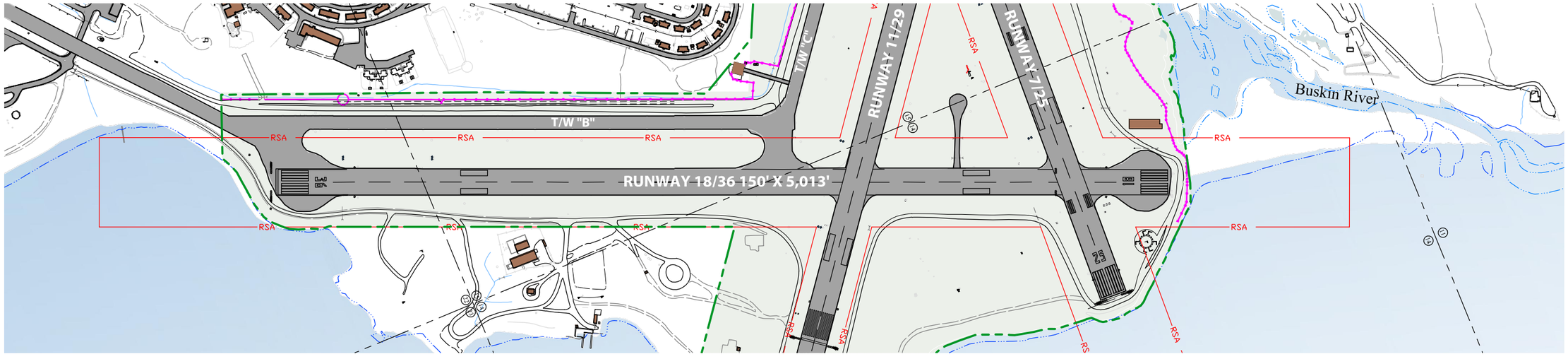


Figure 2-4 **RW18/36 Alternative 1 No Action**

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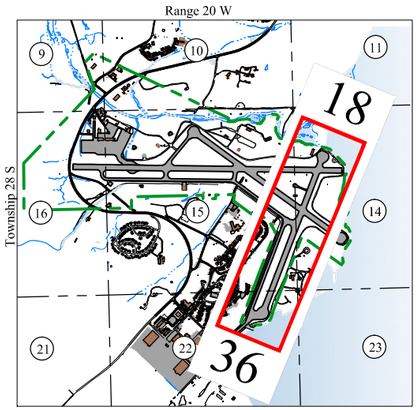
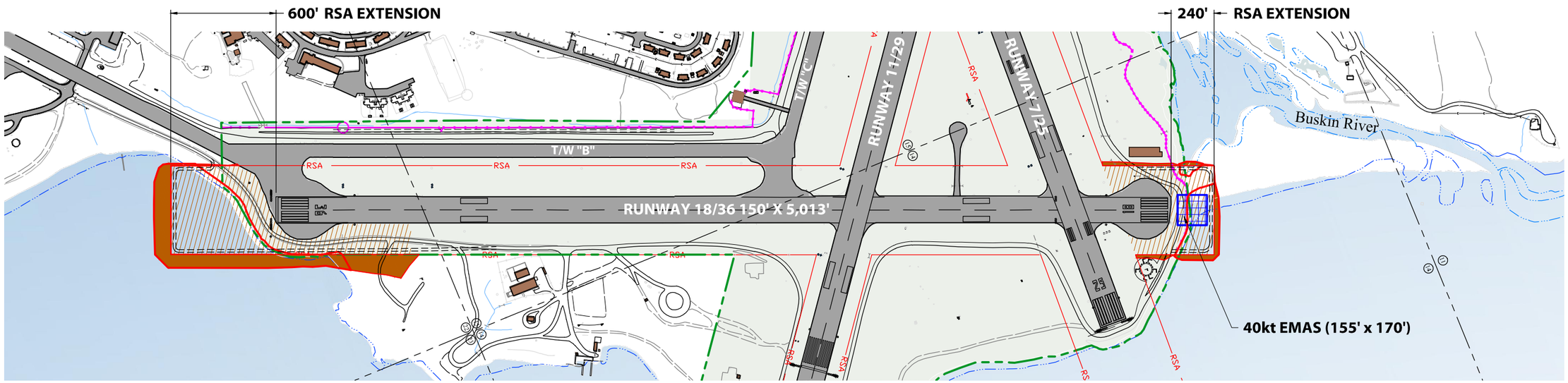
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/240' (1)	0'/600'
Runway 36	0'/600'	0'/240' (1)

(1) Dimension includes EMAS.





Legend

- Airport Property Line
- Airport Security Fence
- RSA — Runway Safety Area
- RSA Improvement/Fill Footprint Boundary

0 150' 300' 600' 900'
GRAPHIC SCALE IN FEET

SOURCE: US COAST GUARD, ALASKA DOT, R&M CONSULTANTS, INC.

Figure 2-5 **RW18/36 Alternative 2**
Extend RSA to south by 600 feet, to north by 240 feet and install 40kt EMAS on newly constructed landmass

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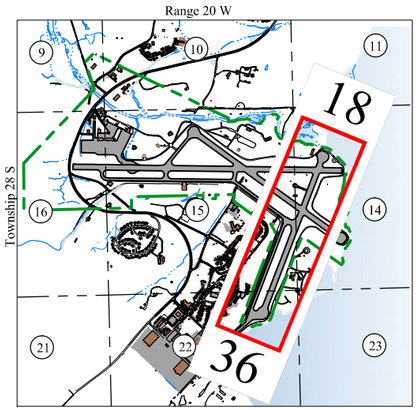
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/450' (1)	0'/240'
Runway 36	0'/240'	0'/450' (1)

(1) Dimension includes EMAS.



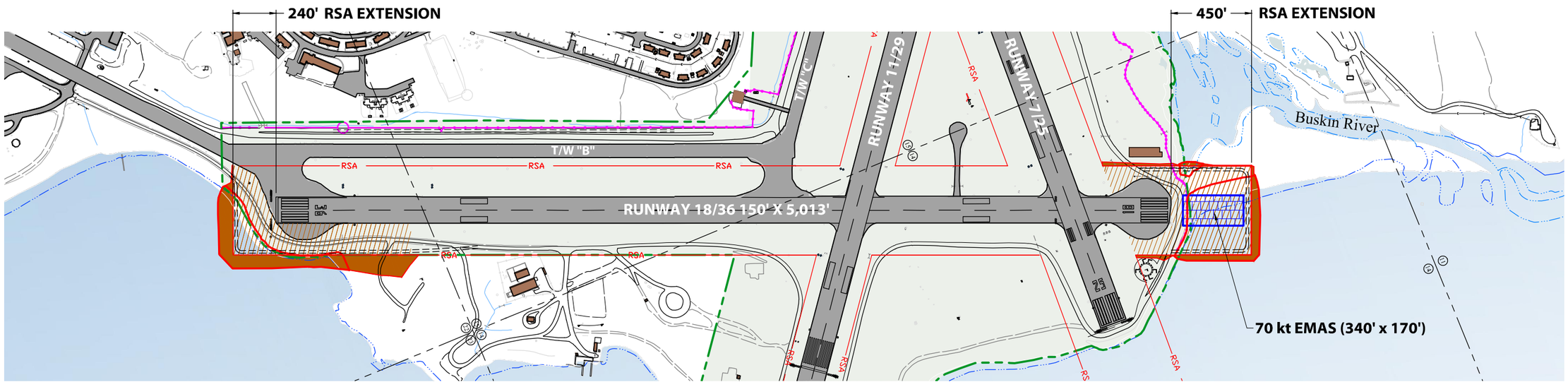


Figure 2-6 **RW18/36 Alternative 3**
Extend RSA to north by 450 feet and south by 240 feet and install 70 kt EMAS on newly constructed landmass

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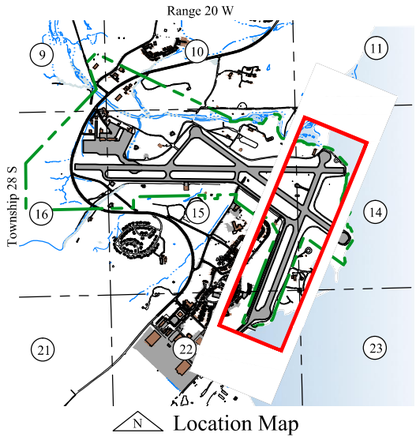
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/300' (1)	0'/300' (1)
Runway 36	0'/300' (1)	0'/300' (1)

(1) Dimension includes EMAS.



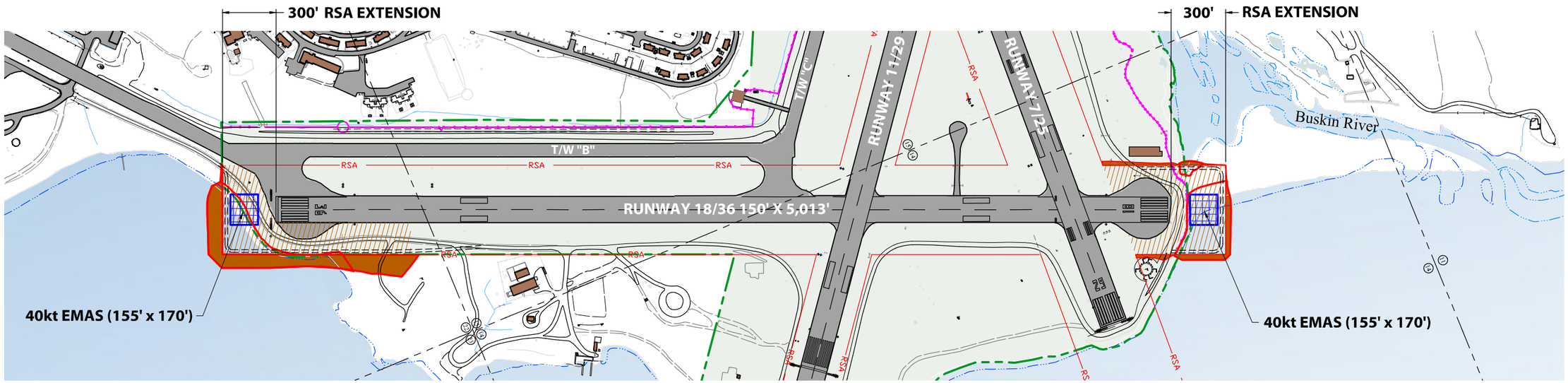


Figure 2-7 **RW18/36 Alternative 4 Extend RSA to north and south by 300 feet and install 40kt EMAS on newly constructed landmass**

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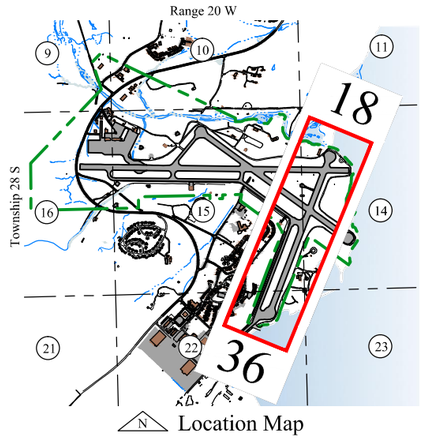
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/600'	0'/600'
Runway 36	0'/600'	0'/600'



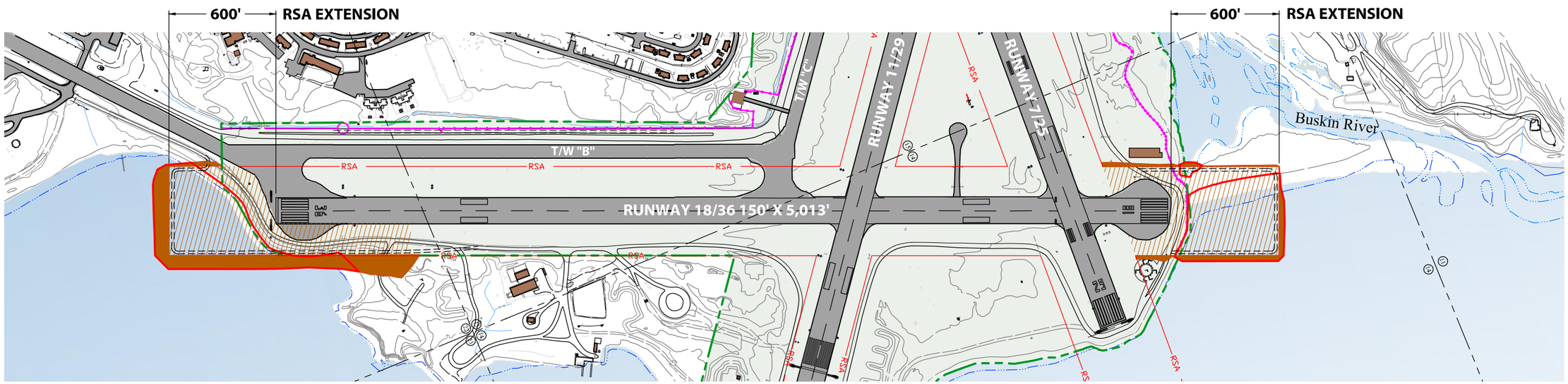


Figure 2-8 **RW18/36 Alternative 5**
Extend RSA to north and south by 600 feet

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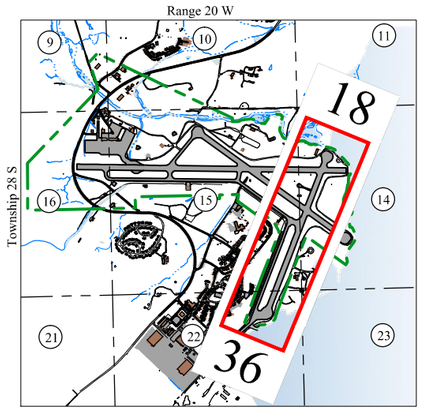
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/240' (1)	0'/450' (1)
Runway 36	0'/450' (1)	0'/240' (1)

(1) Dimension includes EMAS.



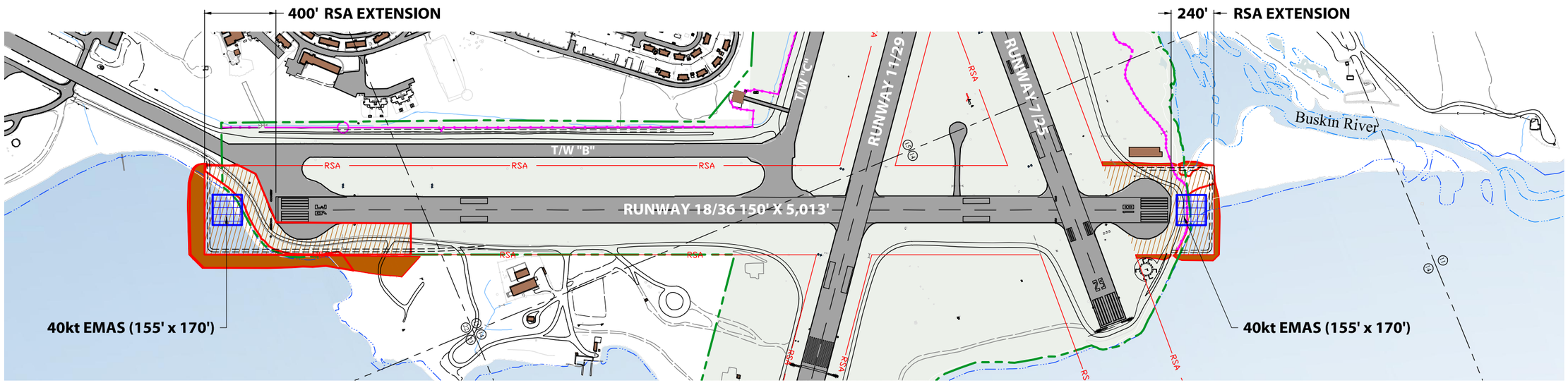


Figure 2-9 **RW18/36 Alternative 6**
Extend RSA to south by 400 feet, to north by 240 feet and install 40kt EMAS on newly constructed landmass

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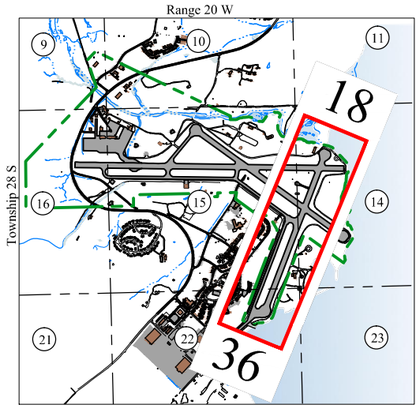
Runway Safety Area Data

Runway End	RSA Undershoot Existing/Future	RSA Overrun Existing/Future
Runway 18	0'/240' (1)	0'/600'
Runway 36	0'/600'	0'/240' (1)

(1) Dimension includes EMAS.



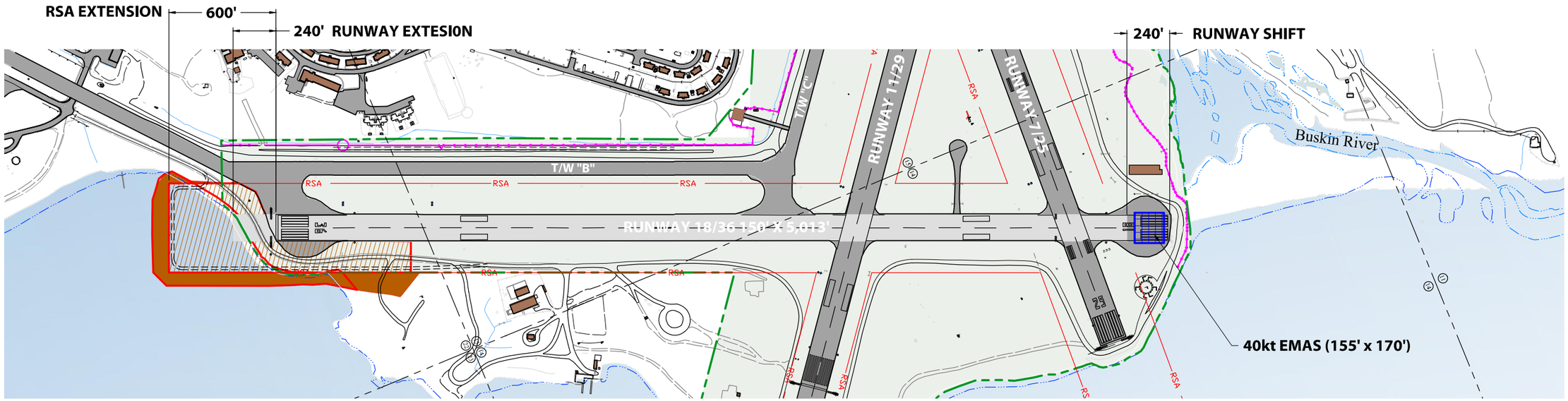


Figure 2-10 **RW18/36 Alternative 7**
Extend RSA to south by 600 feet, shift runway south 240', and install 40kt EMAS on existing pavement

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TABLE 2-2
INITIAL RANGE OF ALTERNATIVES SUMMARY

Runway 07/25	Runway end 07 RSA	Runway end 25 RSA	Meets Runway 07 Overrun Standard	Meets Runway 07 Undershoot Standard	Meets Runway 25 Overrun Standard	Meets Runway 25 Undershoot Standard
Alt. 1	0'	0'	No	Yes	No	No
Alt. 2	0'	600'[1]	Yes	Yes	No	Yes
Alt. 3	0'	1,000'	Yes	Yes	No	Yes
Runway 18/36	**Runway end 18 RSA**	**Runway end 36 RSA**	**Meets Runway 18 Overrun Standard**	**Meets Runway 18 Undershoot Standard**	**Meets Runway 36 Overrun Standard**	**Meets Runway 36 Undershoot Standard**
Alt. 1	0'	0'	No	No	No	No
Alt. 2	240'[2]	600'	No	No	No	Yes
Alt. 3	450'[1]	240	No	No	Yes	No
Alt. 4	300'[2]	300'[2]	No	No	No	No
Alt. 5	600'	600'	No	Yes	No	Yes
Alt. 6	240'[2]	400'[2]	No	No	No	No
Alt. 7	240'[2,3]	360'[3]	No	No	No	No

[1] Incorporates the use of a 70-knot EMAS bed
[2] Incorporates the use of a 40-knot EMAS bed
[3] Incorporates a 240' runway shift to the south onto a 600' constructed landmass

2.4.3 Construction Options Incorporated into the Alternatives.

To evaluate the most economical source of fill and construction material (e.g., gravel, riprap, and armor rock) for improvements to the Kodiak Airport RSAs, a number of potential quarry sites near the Airport and surrounding areas were identified and analyzed. Cost estimates were prepared for each of the alternatives using material from these potential sources. The purpose of this evaluation was to determine the most affordable material sources for the project, thereby maximizing the potential RSA improvement areas achievable within the financial feasibility thresholds (see **Construction Appendix**).

Potential material sources were identified from previous gravel studies and a review of existing sources. A total of 23 potential material sites were identified. Fifteen of these sites have been used as material sources in the past, but not all are currently in use. Based on a review of previous studies and visits to several of the sites, it appears that there is adequate gravel available for the RSA alternatives from sites that are accessible on existing Kodiak roadways.

However, the large quantity of gravel fill required by the alternatives suggests that several sites would be needed as material sources. The ultimate selection of material sources would likely be made by the construction contractor hired by ADOT&PF to complete the project. The selection of sites by the construction contractor would be expected to be a function of whether certain sites are being used for other projects at the time of construction and which sites have already obtained or can obtain environmental permits.

Most of the rock on Kodiak Island is of fairly poor quality and breaks apart easily when disturbed. Therefore, the potential for finding large armor rock on the island is low. Only one of the potential sources is thought to be a source of granite suitable as large armor rock. This site, Shakmanof Cove, is located on the far north end of Kodiak Island and is off the road system. This site has never been used as a material source in the past, but the owners have indicated that they would like to develop it as such. Material from Shakmanof Cove or other Kodiak locations off the road system would have to be barged to the Airport, and would likely have costs similar to material brought from other sites off the island. Medium-sized underlayer stone can be found at some locations on Kodiak Island, but its occurrence varies from site to site. It is estimated that sufficient quantities of underlayer stone would be found at sites on the Kodiak road system.

Based upon the cost estimates developed using each potential material source, the most affordable fill material would likely be supplied from a combination of existing Kodiak Island quarry sites and from regional commercial quarry sources, to minimize cost and transport times. These estimates were included in the financial estimates discussed previously.

2.5 Draft Preferred Alternatives

Preferred Alternatives are those alternatives that the agency believes would fulfill its mission and responsibilities giving consideration to economic,

By regulation, a federal agency is required to identify its "preferred alternative," if one exists, in the Draft EIS (40 CFR 1502.14(e)). As defined in CEQ's "40 Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," an agency's preferred alternative is "the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors" (http://www.nepa.gov/nepa/regs/40/40p3.htm). Taking these factors into account, and after coordinating with federal, tribal, and local stakeholders, the FAA has identified Runway 07/25 Alternative 2 and Runway 18/36 Alternative 7 as its preferred alternatives for this Draft EIS.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 07/25
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 07/25 Alt. 2	Runway 07/25 Alt. 3
Coastal Resources and Navigation	For Alternatives 2-3: CZMA does not apply; Resource specific impacts are detailed in other resource sections.	
Water Quality	For Alternatives 2-3: Increase in impervious surface/stormwater runoff; Moderate changes to sediment transport; moderate decrease in ability of Buskin River mouth to migrate; with BMPs/existing regulations and permits, no significant impacts expected.	
Wetlands and other waters of the U.S.	No fill into wetlands; 9.13 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect effect to maintenance of natural systems supporting fish habitat would result in significant impacts to waters of the U.S.	No fill into wetlands; 15.27 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat would result in significant impacts to waters of the U.S.
Floodplains	For Alternatives 2-3: No fill into Buskin River floodplain. No significant impact.	
Fish and Invertebrates	For Alternatives 2-3: Major loss of juvenile salmonid rearing and foraging habitat; major loss of salmonid prey species habitat; minor increased stormwater runoff; major changes to freshwater plume; moderate changes to sediment transport; moderate decrease in ability of Buskin River mouth to migrate; major potential localized changes to aquatic assemblages. Significant impacts to Fisheries Resources. Effects for Alternative 3 are similar to the long-term impacts described for Runway 07/25 Alt. 2, but the magnitude of adverse impact from Alternative 3 is greater due to increased size of fill footprint.	
Waterbirds	Loss of small percentage of habitat in the Project Area for Steller's Eider (3.4%), Emperor Goose (3.4%), Pelagic Cormorant (2.8%), Black Oystercatcher (3.0%), Marbled Murrelet (2.3%). No significant impacts	Loss of small percentage of habitat in the Project Area for Steller's Eider (5.0%), Emperor Goose (5.0%), Pelagic Cormorant (4.0%), Black Oystercatcher (4.3%), Marbled Murrelet (3.4%). No significant impacts.
Marine Mammals	Loss of small percentage of habitat in Project Area for Marine Mammals (2.9%), N. Sea Otter Critical Habitat (3.5%), and Steller Sea Lion Critical Habitat (3.0%). No significant impacts.	Loss of small percentage of habitat in Project Area for Marine Mammals (4.7%), N. Sea Otter Critical Habitat (5.1%), and Steller Sea Lion Critical Habitat (4.6%). No significant impacts.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 07/25
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 07/25 Alt. 2	Runway 07/25 Alt. 3
Terrestrial Wildlife and Vegetation	1.2% of the total cover impacted in the project area; no federally listed threatened, endangered species in the terrestrial project area; indirect effects on Kodiak brown bear from reduced salmon runs. No significant impact on either special status species or non-listed species.	1.6% of the total cover impacted in the project area; no federally listed threatened, endangered species in the terrestrial project area; indirect effects on Kodiak brown bear from reduced salmon runs. No significant impact on either special status species or non-listed species.
Historical, Architectural, Archaeological, and Cultural Resources	For Alternatives 2-3: No adverse effect on historic properties. There may be long-term, significant adverse effect on customary and traditional practices of the Sun'aq, NVA, and TNV tribes, because marine and river resources that are traditionally harvested and subject to sharing, consumption, or other actions as part of cultural custom may be significantly impacted. Potential impacts would be greater under Alternative 3 than Alternative 2.	
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks	For Alternatives 2-3: Socioeconomic impact on Kodiak residents who use subsistence resources (over 99 percent of the population). Equate to a decrease in approximately 1.4-2.7 pounds per user per year. Because almost all residents in Kodiak tend to use subsistence resources, the impact would affect nearly the entire population; therefore there would not be any disproportionate impact to any just one section of minority or low- income population relative to the use of subsistence resources. However, because subsistence resources affect take home resources for food, the reduction in subsistence resources per capita would likely be felt to a larger extent by low income populations because higher income populations could generally make up the difference in subsistence use through other resources (salary, etc.). Additionally, because subsistence practices are tied to the cultural identity of the Sun'aq Tribe of Kodiak, Tangirnaq Native Village, and the Native Village of Afognak, there could be a disproportionately high and adverse effect on customary and traditional practices and the cultural identity of those minority populations. Potential economic benefit from construction; no effects on children's health or safety. Potential impacts would be less than under Alternative 3 due to greater impact on important habitat near the Buskin River.	

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 07/25
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 07/25 Alt. 2	Runway 07/25 Alt. 3
Subsistence	For Alternatives 2-3: Some loss of immobile subsistence species and temporary displacement of mobile subsistence species during fill placement. Subsistence users would be displaced to other nearby marine areas to gather resources, which would likely increase competition for subsistence resources in those locations. Potential significant long-term impacts to abundance and availability of subsistence resources. Effects on abundance and availability in the affected important freshwater plume habitat because of potential for increased mortality of salmon smolts and, subsequently, returning adult salmonids. Potential impacts would be greater under Alternative 3 than Alternative 2 due to the increased size of fill footprint.	
Noise	For Alternatives 2-3: No change in number of operations, location of operations or the resulting noise contour; no noise sensitive uses in the 65 DNL contour; no effect on Buskin River State Recreation Sites, Alaska Maritime National Wildlife Refuge, or Finny Beach. No significant impacts.	
Compatible Land Use	For Alternatives 2-3: No significant noise impacts; required lease amendment.	
Department of Transportation Section 4(f)	Buskin River State Recreation Site : No physical use. Fishermen in the vicinity of the Airport would likely notice a long-term, measurable decline in salmonid abundance, with the result that the value of the Buskin River State Recreation Site in terms of its significance and enjoyment for sport fishing would be substantially reduced, thereby resulting in a constructive use. Alaska Maritime National Wildlife Refuge: Physical Use of 9.1 acres. National Historic Landmarks: De-minimis impact; no adverse effect on historic properties.	Buskin River State Recreation Site : No physical use. Fishermen in the vicinity of the Airport would likely notice a long-term, measurable decline in salmonid abundance, with the result that the value of the Buskin River State Recreation Site in terms of its significance and enjoyment for sport fishing would be substantially reduced, thereby resulting in a constructive use. Alaska Maritime National Wildlife Refuge: Physical Use of 15.3 acres. National Historic Landmark: De-minimis impact; no adverse effect on historic properties.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 07/25
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 07/25 Alt. 2	Runway 07/25 Alt. 3
Light Emissions and Visual Impacts	For Alternatives 2-3: Moderate short and long-term visual impacts. No significant lighting impacts.	
Hazardous Materials, Pollution Prevention, and Solid Waste	For Alternatives 2-3: No disturbance of known contaminated sites; no substantial waste generated. No significant impacts.	
Farmland	For Alternatives 2-3: No prime or unique farmland impacted.	
Natural Resources and Energy Supply	256,932 cy of fill; small increase in fuel and electric use. No significant impacts.	455,158 cy of fill; small increase in fuel and electric use. No significant impacts.
Air Quality	For Alternatives 2-3: No change in number of aircraft operations; small short-term increases in emissions from construction. No significant impacts.	
Climate	For Alternatives 2-3: No change in number of aircraft operations; small short-term increases in emissions from construction. No significant impacts.	
Wild and Scenic Rivers	For Alternatives 2-3: Project Area does not include any designated wild and scenic rivers, study rivers, or otherwise eligible rivers.	
Construction Impacts	256,932 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	462,081 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.
Secondary (Induced) Impacts	For Alternatives 2-3: No shifts in patterns of population movement or growth; no permanent changes in economic activity; primary effects result from induced effects from significant impacts to fisheries, associated subsistence and cultural practices.	

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Coastal Resources and Navigation	For all Alternatives 2-7 CZMA does not apply; Resource specific impacts are detailed in other resource sections.					
Water Quality	For Alternatives 2-7: Increase in impervious surface/stormwater runoff; with BMPs/existing regulations and permits, no significant impacts expected.					
Wetlands and other waters of the U.S.	Fill into 0.32 acres into wetlands; 10.91 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.	Fill into 0.32 acres into wetlands; 8.24 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.	Fill into 0.32 acres into wetlands; 7.24 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.	Fill into 0.32 acres into wetlands; 15.27 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.	Fill into 0.32 acres into wetlands; 7.97 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.	Fill into 0.11 acres into wetlands; 8.68 acres fill into marine waters; magnitude of tidal waters loss, adverse indirect affect to maintenance of natural systems supporting fish habitat result in significant impacts to waters of the U.S.
Floodplains	For all Alternatives 2-6 Small amount of fill into Buskin River 100-year floodplain; would not result in a considerable probability of loss of human life, likely future damage associated with the encroachment that could be substantial in cost or extent, or a notable adverse impact on the floodplain's natural and beneficial floodplain values. No significant impacts					No fill into Buskin River floodplain. No significant impacts

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Fish and Invertebrates	For all Alternatives 2-6 Major loss of juvenile salmonid rearing and foraging habitat; major loss of salmonid prey species habitat; minor increased stormwater runoff; major changes to freshwater plume; moderate changes to sediment transport; moderate decrease in ability of Buskin River mouth to migrate; major potential localized changes to aquatic assemblages. Significant impacts to Fisheries Resources. Effects would be similar for Alts 2-6, but greater for those alternatives with higher footprints placed on freshwater-influenced habitats near the Buskin River.					Moderate loss of juvenile salmonid rearing and foraging habitat; moderate loss of salmonid prey species habitat; minor increased stormwater runoff; negligible changes to freshwater plume; negligible changes to sediment transport; negligible decreased ability of Buskin River mouth to migrate; moderate potential localized changes to aquatic assemblages. No Significant Impacts to Fisheries Resources.
Waterbirds	Loss of small percentage of habitat in the Project Area for Steller's Eider, Emperor Goose, Pelagic Cormorant, Black Oystercatcher, Marbled Murrelet (1.8-5.0%). No significant impacts.					

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Marine Mammals	Loss of small amount of marine mammal habitat; N. Sea Otter Critical Habitat and Steller Sea Lion Critical Habitat (1.7-4.8%); no significant impacts due to small amount of area lost compared to total habitat, no significant impact on function or conservation role of affected critical habitat.					
Terrestrial Wildlife and Vegetation	Loss of small percentage of the total cover impacted in the project area; no federally listed threatened, endangered species in the terrestrial project area; indirect effects on Kodiak brown bear from reduced salmon runs. No significant impact on either special status species or non-listed species.					Loss of small percentage of total cover impacted in the project area; no federally listed threatened, endangered species in the terrestrial project area; no effects on Kodiak brown bear due to avoidance of fill toward the Buskin River. No significant impact on either special status species or non-listed species.
Historical, Architectural, Archaeological, and Cultural Resources	For all Alternatives 2-6 No adverse effect on historic properties. There may be long-term, significant adverse effect on customary and traditional practices of the Sun'aq Tribe of Kodiak, Native Village of Afognak (NVA) and Tangirnag Native Village (TNV), because marine and river resources that are traditionally harvested and subject to sharing, consumption, or other actions as part of cultural custom may be significantly impacted. Effects would be similar for Alts 2-6, but magnitude of effect differs slightly between alternatives based on extent of fill.					No adverse effect on historic properties. Short-term minor adverse effect on cultural customary and traditional subsistence practices and related cultural practices and identity of the Sun'aq, NVA, and TNV tribes.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36 IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks	Socioeconomic impact on Kodiak residents who use subsistence resources (over 99 percent of the population). Equate to a decrease in approximately 1.4-2.7 pounds per user per year. Because almost all residents in Kodiak tend to use subsistence resources, the impact would affect nearly the entire population; therefore there would not be any disproportionate impact to any just one section of minority or low-income population relative to the use of subsistence resources. However, because subsistence resources affect take home resources for food, the reduction in subsistence resources per capita would likely be felt to a larger extent by low income populations because higher income populations could generally make up the difference in subsistence use through other resources (salary, etc.). Additionally, because subsistence practices are tied to the cultural identity of the Sun'aq, Tangirnaq Native Village, and the Native Village of Afognak, there could be a disproportionately high and adverse effect on customary and traditional practices and the cultural identity of those minority populations. Potential economic benefit from construction; no effects on children's health or safety.					Impacts described for Alts 2-6 would not occur with Alt. 7, because it avoids fill into the Buskin River area, therefore avoiding the potentially significant subsistence impacts; Potential economic benefit from construction; no effects on children's health or safety.
Subsistence	For all Alternatives 2-6 Some loss of immobile subsistence species and temporary displacement of mobile subsistence species during fill placement. Subsistence users would be displaced to other nearby marine areas to gather resources, which would likely increase competition for subsistence resources in those locations. Potential significant long-term impacts to abundance and availability of subsistence resources. Effects on abundance and availability in the affected important freshwater plume habitat because of potential for increased mortality of salmon smolts and, subsequently, returning adult salmonids. Effects would be similar for Alts 2-6, but greater for those alternatives with higher footprints placed on freshwater-influenced habitats near the Buskin River.					No Significant Impacts due to lower use of area south of Runway end 36 by subsistence users and lower relative importance of habitats in this area relative to subsistence species. Placement of fill at Runway end 36 would displace a known herring congregation area.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Noise	For all Alternatives 2-6: No change in number of operations, location of operations or the resulting noise contour; no noise sensitive uses in the 65 DNL contour; no effect on Buskin River State Recreation Sites, Alaska Maritime National Wildlife Refuge, or Finny Beach. No significant impacts.					Slight shift in runway threshold; no noise sensitive uses in the 65 DNL contour.
Compatible Land Use	For all Alternatives 2-6: No significant noise impacts; required lease amendment.					No significant noise impacts; required lease amendment; required modification to avigation easements.
DOT Act Section 4(f)	Buskin River State Recreation Site : No physical use, fishermen in the vicinity of the Airport would likely notice a long-term, measurable decline in salmonid abundance, with the result that the value of the Buskin River State Recreation Site in terms of its significance and enjoyment for sport fishing would be substantially reduced, thereby resulting in a constructive use. Alaska Maritime National Wildlife Refuge: Physical Use of between 7.2 and 15.3 acres of land. National Historic Landmark: De-minimis impact; no adverse effect on historic properties.					Buskin River State Recreation Site : No use Alaska Maritime National Wildlife Refuge: Physical Use of 8.7 acres. National Historic Landmark: De-minimis impact; no adverse effect on historic properties.

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Light Emissions and Visual Impacts	For all Alternatives 2-7: Major short-term visual impacts; minor long-term visual impacts; no significant lighting impacts.					
Hazardous Materials, Pollution Prevention, and Solid Waste	For all Alternatives 2-7: No disturbance of known contaminated sites that have not been cleaned up; no substantial waste generated; no significant impacts.					
Farmland	For all Alternatives 2-7: No prime or unique farmland impacted.					
Natural Resources and Energy Supply	517,354 cy of fill; small increase in fuel and electric use; no significant impacts.	289,049 cy of fill; small increase in fuel and electric use; no significant impacts.	286,248 cy of fill; small increase in fuel and electric use; no significant impacts.	630,235 cy of fill; small increase in fuel and electric use; no significant impacts.	347,625 cy of fill; small increase in fuel and electric use; no significant impacts.	462,081 cy of fill; small increase in fuel and electric use; no significant impacts.
Air Quality	For all Alternatives 2-7: No change in number of aircraft operations; small short-term increases in emissions from construction; no significant impacts.					
Climate	For all Alternatives 2-7: No change in number of aircraft operations; small short-term increases in emissions from construction; no significant impacts.					
Wild and Scenic Rivers	For all Alternatives 2-7: Project area does not include any designated wild and scenic rivers, study rivers, or otherwise eligible rivers.					

TABLE 2-3
ENVIRONMENTAL IMPACT SUMMARY RUNWAY 18/36
IMPROVEMENTS TO THE RUNWAY SAFETY AREA

Impact Category	Runway 18/36 Alt. 2	Runway 18/36 Alt.3	Runway 18/36 Alt.4	Runway 18/36 Alt.5	Runway 18/36 Alt.6	Runway 18/36 Alt.7
Construction Impacts	517,354 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	289,049 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	286,248 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	630,235 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	347,625 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.	462,081 cy of fill; air, water, noise and surface transportation impacts from construction that would be temporary and not significant due to use of BMPs and avoidance/minimization measures.
Secondary (Induced) Impacts	No shifts in patterns of population movement or growth; no permanent changes in economic activity; primary effects result from induced effects from significant impacts to fisheries, associated subsistence and cultural practices.					No shifts in patterns of population movement or growth; no permanent changes in economic activity; no significant impact on fisheries, subsistence, or resulting induced impacts due to avoidance of Buskin River.

References

- Airport Traffic Control Tower data, 2008-2010.
- Council on Environmental Quality Regulations, Section 1502.14.
- Council on Environmental Quality Regulations, Section 1502.14(c), (d), (e).
- Alaska Ferry Adventures, 2012, http://www.akmhs.com/schedules/.
- FAA Order 5200.8, *Runway Safety Area Program*.
- FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety*.
- FAA Advisory Circular (AC) 150/5300-13, *Airport Design*.
- "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," http://www.nepa.gov/nepa/regs/40/40p3.htm.